EUROPEAN COMMISSION

Brussels, 2 March, 2026

Guideline
On the Candidate Laboratory alignment procedure

SCOPE

This guideline is prepared in order to clarify the process for candidate laboratory alignments set out in applying for ANNEX V of Regulation (EU) 2020/740 and reflects findings described in the Final Report - Review study on the Regulation (EC) Nº 1222/2009 on the labelling of tyres, March 2016, prepared for: European Commission, DG ENER C.3, Brussels, Belgium in order to increase the accuracy and reproducibility of the rolling resistance tests.

DEFINITIONS

For the purpose of the laboratory alignment procedure, the following definitions apply:

(1) "Reference laboratory" means a laboratory that is part of the network of laboratories, the name of which have been published for the purpose of the alignment procedure in the *Official Journal of the European Union,* and is able to achieve the accuracy of test results determined in section 3 with his reference machine.
The Reference laboratory shall comply with ISO/IEC 17025.

(2) "Candidate laboratory" means a laboratory intended to measure new test tyres, upon alignment of his candidate machine to a reference laboratory according to this document;
the Candidate laboratory shall comply with ISO/IEC 17025.

(3) "Alignment tyre" means a tyre measured by both the candidate and reference laboratory to perform machine alignment.

(4) "Alignment tyres set" means a set of five or more alignment tyres for the alignment of one single machine.

(5) "Assigned value" means a theoretical value of the Rolling Resistance Coefficient of one alignment tyre as measured by a theoretical laboratory which is representative of the network of reference laboratories that is used for the alignment procedure.

(6) “Machine” means every tyre testing spindle with one specific measurement method. For example, two spindles acting on the same drum shall not be considered as one machine. One spindle able to measure tyre rolling resistance through different methods shall not be considered as one machine.

(7) “New test tyre” means a tyre which has not been previously used in a rolling deflected test which elevates the tyre’s temperature to higher than that generated in rolling resistance tests or has not been exposed to a temperature higher than 40 deg C. Repetition of allowed test procedures is permitted (example ISO 28580).

PRINCIPLE

The measured (*m*) Rolling Resistance Coefficient obtained by a machine in a candidate laboratory (*c*), $RRC_{m,c}$, shall be aligned through one reference laboratory of the network of its choice.

CLARIFICATIONS ON TYRE SELECTION REQUIREMENTS

A set of five or more alignment tyres shall be selected for the alignment procedure in compliance with the criteria below. One set shall be selected for C1 and C2 tyres together, and one set for C3 tyres.

(a) The set of alignment tyres shall be selected so as to cover the range of different *RRCs* of C1 and C2 tyres together, or of C3 tyres. In any event, the difference between the highest RRC_m of the tyre set, and the lowest RRC_m of the tyre set shall be, before and **after** alignment, at least equal to
   (i) 3 N/kN for C1 and C2 tyres, and
   (ii) 2 N/kN for C3 tyres.

(b) The *RRCm* in the candidate or reference laboratories ($RRC_{m,c}$ or $RRC_{m,l}$) based on declared RRC values of each alignment tyre of the set shall be distributed evenly.

(c) Load index values shall adequately cover the range of the tyres to be tested, ensuring that the Rolling Resistance Force (RRF) values also cover the range of the tyres to be tested.

(d) The ratio of rolling resistance force (Fr) between the highest Fr and the lowest Fr of the tyre set shall be, before alignment, at least equal to 2 for the sets of C1/C2 and C3 tyres.

Each alignment tyre shall be checked prior to use and replaced when:

(a) it shows a condition which makes it unusable for further tests, and/or

(b) there are deviations of $RRC_{m,c}$ or $RRC_{m,l}$ greater than 1.5 per cent relative to earlier measurements after correction for any machine drift.

CLARIFICATIONS ON THE PROCEDURE FOR THE ALIGNMENT OF A CANDIDATE LABORATORY

The candidate or reference laboratory shall calculate:

(a) the measured value of each alignment tyre for each measurement as specified in Annex 6, paragraphs 6.2 and 6.3, of UNECE Regulation No 117 and its subsequent amendments (i.e. corrected for a temperature of 25°C and a drum diameter of 2 m),

(b) in the case of reference laboratories, the mean value of the three last measurements of each alignment tyre (measurements 2, 3 and 4) or in the case of candidate laboratories the mean value of the n last measured values of each alignment tyre (measurements 2 to n+1), and

(c) the standard deviation (σ_m) as follows:

$$\sigma_m = \sqrt{\frac{1}{p} \cdot \sum_{i=1}^{p} \sigma^2{}_{m,i}}$$

$$\sigma_{m,i} = \sqrt{\frac{1}{n-1} \cdot \sum_{j=2}^{n+1} \left(Cr_{i,j} - \frac{1}{n} \cdot \sum_{j=2}^{n+1} Cr_{i,j} \right)^2}$$

where:

i is the counter from 1 to p for the alignment tyres
j is the counter from 2 to n+1 for the n last repetitions of each measurement of a given alignment tyre
n+1 is the number of repetitions of tyre measurements (n+1=4 for reference laboratories and n+1 ≥4 for candidate laboratories)
p is the number of alignment tyres (p ≥ 5).

One reference laboratory (*l*) of the network shall calculate the linear regression function on the n last measured values (measurements 2 to n+1) of the candidate laboratory (*c*). The regression coefficients, $A2_c$ and $B2_c$, shall be calculated as follows:

$RRC_{m,l} = A2_c \times RRC_{m,c} + B2_c$

where:

$RRC_{m,l}$ is the individual measured value of the rolling resistance coefficient by the reference laboratory (*l*) (including temperature and drum diameter corrections).

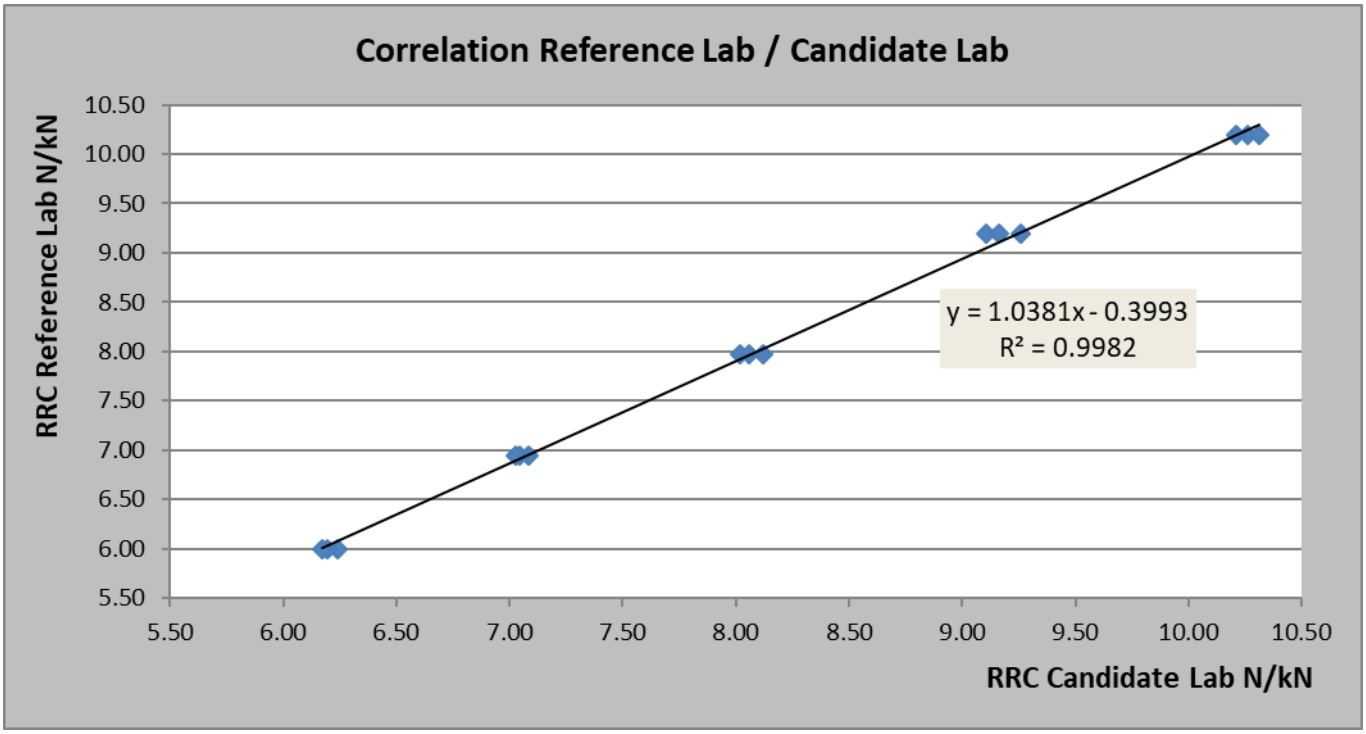
$RRC_{m,c}$ is the individual measured value of the rolling resistance coefficient by the candidate laboratory (*c*) (including temperature and drum diameter corrections).

If the coefficient[2] of determination R^2 is lower than 0.97 the candidate laboratory shall not be aligned.

The aligned *RRC* of tyres tested by the candidate laboratory is calculated as follows:

$RRC = (A1_l \times A2_c) \times RRC_{m,c} + (A1_l \times B2_c + B1_l)$.

Example:



[2] The coefficient of determination R^2 is defined as the sum of squares due to the regression divided by the total sum of squares. Usually, R^2 is interpreted as representing the percentage of variation of the dependent variable explained by variation of the independent variables.

CLARIFICATIONS ON REQUIREMENTS APPLICABLE TO CANDIDATE LABORATORIES

Candidate laboratories shall repeat the alignment procedure at least once every second year for every machine and always after any significant machine change or any drift in machine control tyre monitoring data.

A common set of at least five different tyres, conforming to the selection requirements as specified above shall be measured in accordance with the requirements of the procedure specified in Annex 6 of UNECE Regulation No 117, firstly by the candidate laboratory and later on by one reference laboratory. More than five alignment tyres may be tested at the request of the candidate laboratory.

The alignment tyre set shall be provided by the candidate laboratory to the selected reference laboratory.

The candidate laboratory (c) shall comply with the specifications of Annex 6 of UNECE Regulation No117 and its subsequent amendments and preferably have standard deviations (σ_m) as follows:

(i) not greater than 0.075 N/kN for C1 and C2 tyres, and
(ii) not greater than 0.060 N/kN for C3 tyres.

If the standard deviation (σ_m) of the candidate laboratory is higher than the above values with four measurements, the last three ones being used for the computations, then the number n+1 of measurement repetitions shall be increased as follows for the entire batch of tires:

$n+1 = 1+(\sigma_m/\gamma)^2$, rounded up to the nearest higher integer value

where:

$\gamma = 0.043$ N/kN for Class C1 and C2 tyres

$\gamma = 0.035$ N/kN for Class C3 tyres.

Template for candidate / reference laboratory alignment

1. General information of Applicant (Candidate laboratory)

Company: _____
Address: _____
City: _____ P.O. Box: _____
Contact person: _____ Position: _____
Telephone: _____ Fax: _____ E-mail: _____

a) Tyre manufacturer ☐ b) Independent laboratory ☐

Is your company integrated in a Group? ☐ Yes ☐ No
If yes, indicate which one: _____

Candidate machine identification
Trade Mark: _____ Serial number: _____
Test Lab location: _____ Year of make: _____
Date of last calibration: _____
The laboratory is certified/accredited/compliant to ISO 17025 ☐
The facility is certified / compliant to ISO /TS 16949 ☐
The laboratory complies with the specifications of Appendix 1 to Annex 6 of UNECE Regulation No. 117 on test equipment tolerances ☐
Drum Ø [mm]: _____
Drum Surface: _____
Drum material: _____

Where to send the test tyres after testing:
Address: _____
City: _____ P.O.Box:_____
Contact person: _____

Test tyres provided:
Tyre type: ☐ C1/C2 ☐ C3
Method: ☐ Force ☐ Torque ☐ Power ☐ Deceleration

Test results of the n+1 measurements (corrected for drum diameter and room temperature) (The n last measured values (2 to n+1) of the candidate laboratory are used for the regression analysis)

Tyre : Make - Size – Designation	$RRC_{1,c}$ (N/kN)	$RRC_{2,c}$ (N/kN)	$RRC_{3,c}$ (N/kN)	$RRC_{4,c}$ (N/kN)	.....	$RRC_{n+1,c}$ (N/kN)

Candidate machine measurement reproducibility: σ_m (N/kN): _____

2. General information of the Reference laboratory

Company: _____
Address: _____
City: _____ P.O. Box: _____
Contact person: _____ Position: _____
Telephone: _____ Fax: _____ E-mail: _____

a) Tyre manufacturer ☐ b) Independent laboratory ☐

Reference machine identification
Trade Mark: _____ Serial number: _____
Test Lab location: _____ Year of make: _____
Date of last calibration: _____
The laboratory is certified/accredited/compliant to ISO 17025 ☐
The facility is certified / compliant to ISO /TS 16949 ☐
The laboratory complies with the specifications of Appendix 1 to Annex 6 of UNECE Regulation No. 117 on test equipment tolerances ☐
Drum Ø [mm]: _____
Drum Surface: _____
Drum material: _____

Test characteristics:
Method: ☐ Force ☐ Torque ☐ Power ☐ Deceleration

Test results, average of measurement 2 – 4, corrected for drum diameter and temperature:

Tyre : Make - Size – Designation	$RRC_{2,I}$ (N/kN)	$RRC_{3,I}$ (N/kN)	$RRC_{4,I}$ (N/kN)	RRC avg. (N/kN)

3. Alignment equation

Regression formula[1]:

RRC = aligned value (N/kN)

$RRC_{m,c}$ = candidate's measurement (N/kN)

$RRC = a * RRC_{m,c} + b$

a = _____ **b = _____**

$a = A1_l * A2_c$
$b = A1_l * B2_c + B1_l$

Coefficient of determination[2]: R^2 = _____

Date: _____

Stamp and Signature: _____

[1] **$A1_l$, $B1_l$, $A2_c$ and $B2_c$ are the coefficients defined in Annex V of Regulation (EU) 2020/740**
RRC is the assigned value of the rolling resistance coefficient aligned to EU Reference.
$RRC_{m,l}$ is the individual measured value of the rolling resistance coefficient by the reference laboratory (l) (including temperature and drum diameter corrections)
$RRC_{m,c}$ is the individual measured value of the rolling resistance coefficient by the candidate laboratory (c) (including temperature and drum diameter corrections)

[2] **Coefficient of determination R^2 is defined as the sum of squares due to the regression divided by the total sum of squares. Usually, R^2 is interpreted as representing the percentage of variation of the dependent variable explained by variation of the independent variables.**